Prevention Practices for Perinatal Group B Streptococcal Disease: A Multi-State Surveillance Analysis

CYNTHIA G. WHITNEY, MD, BRIAN D. PLIKAYTIS, MS, WENDOLYN S. GOZANSKY, MD, JAY D. WENGER, MD, AND ANNE SCHUCHAT, MD, FOR THE NEONATAL GROUP B STREPTOCOCCAL DISEASE STUDY GROUP

Objective: **To evaluate hospital-based practices for perinatal group B streptococcal disease prevention and to identify institutional factors related to the disease.**

Methods: **We surveyed microbiology laboratories and obstetric programs during 1994 at hospitals in five states with active surveillance for invasive group B streptococcal disease. Institutions provided information on methods for detecting carriers and on obstetric policies for group B streptococcal disease prevention. We used linear regression to identify prevention practices and hospital characteristics that correlated with the number of cases of early-onset disease.**

Results: **Of 295 hospitals, 247 (84%) laboratories and 154 (52%) obstetric programs completed the survey. Most (83%) laboratories performed group B streptococcal cultures on rectal and vaginal specimens, but only 12 (6%) used selective broth media. Among the obstetric programs, 54 (35%) had policies on some aspect of group B streptococcal disease prevention. Of the hospitals with policies, 21 (48%) recommended intrapartum antimicrobial prophylaxis for women with risk factors outlined by the 1992 ACOG statement. Adjusting for the number of births, there were more cases of early-onset group B streptococcal disease in institutions providing care for more African American women and for more women with no prenatal care. Institutions that had group B streptococcal screening policies had fewer early-onset cases.**

Conclusion: **Many institutions with prevention policies followed practices that differed from those recommended in published prevention statements. Having any screening policy, however, was associated with reduced early-onset disease, independent of the risk profile of the patient population. Adopting prevention policies is most urgent for practices serving individuals at increased risk, such as African American women and women without prenatal care.** *(Obstet Gynecol 1997;89:28–32. Copyright © 1997 by The American College of Obstetricians and Gynecologists.)*

Group B streptococcus is the most common cause of sepsis in infants in the first week of life. Several studies [1–4] have shown that systematic use of intrapartum antimicrobial prophylaxis can reduce early-onset group B streptococcal disease in newborns. Although there is little argument that intrapartum antimicrobial prophylaxis is effective, selection of a target group of women at risk has been the focus of considerable debate.

In 1992, ACOG[5] and the American Academy of Pediatrics[6] each published statements regarding the prevention of perinatal group B streptococcal infections that prompted concerns about implementation. Questions focused on cost, the need to respond consistently to clinical risk factors at delivery, and the potential development of resistant organisms from increased use of antimicrobial agents. A critical concern with strategies that require prenatal screening is that some carriers will not be detected unless specimen collection and group B streptococcal isolation are done appropriately.

Surveillance data suggested that the incidence of neonatal group B streptococcal disease had not changed measurably as of 1993 (Centers for Disease Control and Prevention [CDC], unpublished data). In addition, a 1993 survey of Georgia clinicians indicated that most did not use optimal techniques for collecting screening

From the Centers for Disease Control and Prevention, Atlanta, Georgia.

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The Neonatal Group B Streptococcal Disease Study Group included: Atlanta—G. Urwin, MD, W. Baughman, MSPH, M. Farley, MD; Maryland—L. Billmann, RN, MPH, D. Dwyer, MD, L. Harrison, MD; Missouri—M. Huber, RN, M. Skala, MA; San Francisco—K. Spaniel, MPH, G. Rothrock, MPH, A. Reingold, MD; Oklahoma—L. Smithee, MS, P. Quinlisk, MD, MPH; and CDC—K. Deaver-Robinson, MPH.

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cultures and most believed that there were no clear guidelines on screening.[7] To determine the extent to which institutions have formally addressed group B streptococcal disease prevention, we surveyed obstetric department and microbiology laboratory directors in five areas where active case finding for group B streptococcal disease was ongoing. The survey's objectives were to determine hospital-based policies for neonatal group B streptococcal disease prevention and to assess the laboratory methods used for screening cultures during 1994. We combined these reported practices with surveillance data to determine whether certain interventions were related to the magnitude of early-onset group B streptococcal disease at a hospital.

Table 1. Respondents' Policies on Prevention of Neonatal Group B Streptococcal Disease

Policy status	GBS prevention in general (n = 147)*	Prenatal screening for GBS carriage (n = 145)	Intrapartum antimicrobial use (n = 147)
No policy, not considering one	45 (30.6%)	42 (29.0%)	37 (25.2%)
No policy, but are discussing one	57 (38.8%)	56 (38.6%)	53 (36.1%)
No policy, but are developing one	8 (5.4%)	11 (7.6%)	7 (4.8%)
Verbal policy	26 (17.7%)	28 (19.3%)	33 (22.4%)
Written policy	11 (7.5%)	8 (5.5%)	17 (11.6%)

GBS = group B streptococcus.
* Denominators differ from total of 154 questionnaires returned because of missing responses.

Materials and Methods

From July to December 1994, we mailed structured questionnaires to all hospitals with obstetric services in five geographic areas that were part of a CDC active surveillance system. Surveillance coordinators reminded survey non-responders by mail or telephone. Participating surveillance areas included the eight-county metropolitan Atlanta area (n = 20 hospitals), the three counties in the San Francisco Bay area (n = 29 hospitals), and the entire states of Oklahoma (n = 87), Missouri (n = 123), and Maryland (n = 36). These areas represent an aggregate population of 18 million persons (1990 census) and have 282,000 annual births (1993 birth certificate data).

The survey had three parts. Part I, sent to directors of obstetric departments, addressed the existence and content of a hospital policy for prevention of neonatal group B streptococcal disease. Part II, sent to microbiology laboratory directors, addressed laboratory practices for detection of group B streptococcal carriers. Part III solicited information on the academic affiliation of obstetric programs and basic demographic information on in-hospital births during 1993; this part was completed by either the hospital's administrator or obstetric department personnel.

Active surveillance for invasive group B streptococcal disease was conducted according to methods reported previously.[8,9] Periodic audits of all laboratories were conducted to ensure complete reporting. We defined early-onset disease as group B streptococci isolated from the blood or other sterile sites during the first week of life.

Respondents' practices were compared with the practices suggested by the prevention statements published in 1992 by ACOG[5] and by the American Academy of Pediatrics.[6] Corrected χ^2 tests were used to compare proportions for categorical variables. We used multiple linear regression with stepwise selection (REG procedure in the SAS software system; SAS Institute Inc., Cary, NC) to determine hospital-associated risk factors for early-onset group B streptococcal disease. The number of cases of early-onset group B streptococcus in the hospital, as determined by surveillance data, was the dependent variable, and the number of births in the hospital was a covariate in all analyses. Variables that were associated significantly with the number of early-onset group B streptococcal cases, were potential confounders, or were of interest from earlier studies were included in the multivariate model. To prevent problems due to multicollinearity, we centered all variables by subtracting the mean of the variable from each observation and then standardized them to a common scale by dividing the differences by the variable's standard deviation. Variables were considered statistically significant at $P < .05$ and $P < .1$ for univariate and multivariate analyses, respectively.

Results

Response rates were higher for the laboratory and hospital profile information (n = 247 [84%] and n = 234 [79%], respectively) than for the obstetric policy section (n = 154, 52%). A total of 128 (43%) hospitals returned all three survey parts.

In 1994, 54 (35%) of 154 hospitals that provided obstetric policy information had policies on any aspect of neonatal group B streptococcal disease prevention; 18 (12%) hospitals had any portion of their policies in writing (Table 1). Institutions with policies on prenatal screening (n = 36) were much more likely than those without screening policies to also have a policy on intrapartum antimicrobial use (32 [89%] versus 18 [15%]; relative risk 5.8, 95% confidence interval 3.8, 9.0; $P < .001$). Notably, 65 (65%) of 100 respondents without a prevention policy in 1994 stated that they were

Table 2. Content of Policies on Prenatal Screening

Screening policy content	No. (Total = 32 policies)
Indication for screening women (multiple responses permitted)	
Per physician discretion	16 (50%)
Previous infant with group B streptococcal disease	15 (47%)
Previous preterm delivery	12 (38%)
All women	9 (28%)
On request	6 (19%)
No one screened	2 (6%)
Screening culture sites	
Vagina only	9 (28%)
Vagina and cervix	8 (25%)
Rectum and vagina	6 (19%)
Rectum, vagina, and cervix	4 (13%)
Cervix only	3 (6%)
No specific recommendation	2 (6%)
Timing (wk of gestation)	
<20	4 (13%)
20–24	0
25–28	7 (22%)
29–32	1 (3%)
>32	6 (19%)
More than 1 time	6 (19%)
No specific time	8 (25%)

discussing or developing a policy for prenatal screening or intrapartum antibiotic use; of those who had policies, 66% had established the policy after January 1993. Institutions with medical school or residency program affiliations were more likely to have a prevention policy than other centers (17 [36%] versus 17 [18%]; $P = .03$), as were institutions with a neonatal intensive care unit (25 [53%] versus 30 [31%]; $P = .02$). We found no association between having a prevention policy and the number of deliveries annually, the proportion of women on medical assistance, or the proportion of women without prenatal care.

Thirty-two of the 36 respondents with policies on prenatal screening provided information on the specific content of their screening policy (Table 2). Only two respondents had screening policies consistent with the 1992 American Academy of Pediatrics recommendations[6]: screening all women, culturing both the vagina and rectum, and collecting cultures after 26 weeks' gestation. Only ten (31%) policies recommended collecting swabs from both the rectum and vagina (with or without cervical cultures).

Forty-five of 50 (90%) respondents with policies addressing the use of intrapartum antimicrobial prophylaxis provided information on specific policy content (Table 3). Nearly two-thirds ($n = 29$, 64%) of respondents' policies recommended giving intrapartum antimicrobial prophylaxis to all women who were identified as group B streptococcal carriers on prenatal screening culture. Twenty-one institutions (48%) had policies in agreement with ACOG's 1992 statement,[5] which suggested administration of intrapartum antimicrobial prophylaxis for women with a risk factor (intrapartum fever, preterm labor, prolonged duration of membrane rupture, or previous infant with group B streptococcal disease) when carrier status is unknown.

Of the 247 laboratories from which a survey was returned, 205 (83%) performed cultures for group B streptococcus from the genital tract ($n = 200$ laboratories, 81%) or rectum ($n = 76$, 31%). For genital tract cultures, few laboratory directors reported using broth media, with 29 (15%) and 12 (6%) using nonselective and selective broth media, respectively, during their isolation procedures. For laboratories that isolated group B streptococcus from rectal specimens, only six (13%) used selective broth media. Use of selective broth media did not differ between institutions with versus without a screening policy.

Sufficient data were available from 118 institutions for inclusion in an analysis of hospital characteristics associated with group B streptococcal disease. These hospitals represented a total of 129,000 births and 185 cases of early-onset group B streptococcal disease during 1993.

Multivariate analysis of hospital-associated risk factors demonstrated that the number of early-onset cases increased with the number of African American parturients (parameter estimate 0.45, $P < .001$) and with the number of parturients with no prenatal care (parameter estimate 0.18, $P = .01$), independent of other factors and

Table 3. Policy Recommendations for Use of Intrapartum Antimicrobial Prophylaxis

When to administer prophylaxis	GBS screening results		
	GBS(+) ($n = 45$)	Unknown ($n = 44$)	GBS(−) ($n = 44$)
All women	29 (64%)		
No women			8 (18%)
Fever	25 (56%)	37 (84%)	30 (68%)
Prolonged duration of membrane rupture	23 (51%)	31 (70%)	19 (43%)
Preterm delivery	24 (53%)	26 (59%)	15 (34%)
Previous infant with GBS disease	23 (51%)	33 (75%)	18 (41%)
GBS urinary tract infection prenatally	9 (20%)	20 (45%)	13 (30%)
Per physician discretion	2 (4%)	3 (7%)	2 (5%)
Per ACOG recommendations		21 (48%)	
Per American Academy of Pediatrics recommendations	5 (11%)		

GBS = group B streptococcus.

controlling for the number of births. Conversely, hospitals with a screening policy had significantly fewer early-onset group B streptococcal cases (parameter estimate −0.15, $P < .001$), adjusting for the other factors. Factors that were included in modeling but were not associated independently with the number of early-onset cases included the number of deliveries to women receiving medical assistance, median length of stay for women after delivery, the existence of a policy on intrapartum antimicrobial use, academic affiliation, and presence of a neonatal intensive care unit.

Discussion

The survey results suggest that as of mid-1994, only a minority (38%) of hospital obstetric programs had adopted a formal strategy for prevention of perinatal group B streptococcal disease; an even smaller percentage (12%) had committed such policies to writing. Respondents' prevention policies varied in content and scope from each other and from previously published national recommendations. Many respondents reported following the 1992 ACOG guidelines for use of intrapartum antimicrobial prophylaxis, but 40% indicated that their policies did not include preterm delivery as an indication for intrapartum antimicrobial prophylaxis. This suggests that missed opportunities for prevention may occur among women whose infants are at high risk for group B streptococcal disease. Although even a perfectly applied strategy will not prevent all neonatal cases, ensuring that prevention approaches account for persons at high risk may reduce the amount of disease as much as possible.

We also found that many institutions that perform prenatal screening for group B streptococcal carriage could improve their sampling and isolation techniques. Collecting a swab from the rectum in addition to the distal vagina will result in identification of 27–84% more carriers than vaginal cultures alone; collecting swabs from the cervix has the lowest yield of the three sites.[10–13] In addition, collecting cultures late in pregnancy can result in better detection of women who will be colonized at delivery.[11,14] Another crucial technical issue is the use of selective broth media, which can improve the isolation rate by 48–56% over direct plating methods.[12,15]

Our findings indicate that having an institutional policy for prevention of early-onset group B streptococcal disease has an important impact on disease occurrence, despite the variety of prevention policies reported by the participants. A cost-effectiveness analysis of 19 strategies by Rouse et al[16] suggested that any of a number of prevention practices is likely both to reduce early-onset group B streptococcal disease and to save money compared with no intervention; other studies[1–4,17,18] also have demonstrated the effectiveness of prevention practices. Although our analysis suggests that a screening policy is the more important aspect of a prevention strategy compared with a policy for intrapartum antimicrobial prophylaxis, nearly all respondents who had screening policies also had policies covering intrapartum antimicrobial use. This finding suggests that having a policy covering screening could be a correlate for a more comprehensive prevention strategy.

Our analysis also identifies characteristics of "high-risk" hospitals, whose patients have a higher rate of perinatal group B streptococcal disease than patients in other institutions. Hospitals with high proportions of African American women or of women without prenatal care had more cases of early-onset group B streptococcal disease than other hospitals, independent of low birth weight and the number of patients receiving medical assistance. Surveillance data from the CDC have demonstrated higher rates of group B streptococcal disease in African Americans of all ages.[8,9] Although the greater risk among African Americans may be multifactorial, one study[19] of group B streptococcal carriage among pregnant women reported higher rates among African American women than among other women.

Certain limitations of our study should be mentioned. First, only about half of the obstetric departments surveyed returned the questionnaire; therefore, the survey may not be representative of all hospitals in our surveillance areas or of those in the United States as a whole. However, our multivariate analysis was based on data from a large number of hospitals ($n = 118$) representing 129,000 births, suggesting that these findings may be more generalizable than smaller evaluations. The self-reported responses may not have corresponded to actual practices, and we did not confirm whether the reported prevention policy was actually in effect. Finally, because so few institutions had detailed prevention policies, our study did not have the power to determine whether various factors (eg, whether the policy was in writing) affected the rate of early-onset group B streptococcal disease in a hospital.

Prevention of perinatal group B streptococcal disease is gaining more attention from patients and physicians; two-thirds of respondents who did not have prevention policies at the time of the survey were discussing or developing such policies. Because clinicians may have been reluctant to adopt prevention practices while there was debate over the optimal approaches, CDC has worked with ACOG, the American Academy of Pediatrics, and a multidisciplinary panel of experts to reach consensus on strategies for the prevention of perinatal

group B streptococcal disease.[20,21] Two approaches to prevention are recommended by CDC. The first involves prenatal screening at 35–37 weeks' gestation for all pregnant women; all identified carriers are to be offered intrapartum antimicrobial prophylaxis, as are those who are delivering preterm before a culture result is available. The CDC guidelines also recommend a non-screening approach as an acceptable alternative. Implementing a prevention policy at "high-risk" institutions is urgent. The actual magnitude of disease reduction attainable with enhanced prevention practices is not known, but continued surveillance for perinatal group B streptococcal disease will be critical to assess the impact of the new guidelines.

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Address reprint requests to:
Anne Schuchat, MD
Centers for Disease Control and Prevention
Mailstop C-23
1600 Clifton Road NE
Atlanta, GA 30333

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